SOME ESSENTIALS TO A SAFE DIET

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In my association during the summer in Washington with the various women in the field of home economics who were working in association with the food administration, I saw a great many charts and illustrations regarding comparative food values, and I was struck particularly with one type of product which came from various sources. I refer to such charts as illustrate the cost of a hundred calories of energy or the cost of a pound of digestable protein. In such charts we find invariably that for a dollar one can purchase the greatest amount of energy in the form of one of the cereal grains or their milled products, depending upon the market price at the particular time. The cheapest energy foods are those that are derived from the cereal grains

Now what effect will the distribution of such illustrative matter broadcast over the land have upon the dietary habits of the people of the United States at the present time? I think the answer is clear. Never before has the cost of foodstuffs risen to the present point. It is taxing very seriously the budget of numerous households to meet the food requirements of the family. I feel that there is an element of danger in giving the housewife this information without supplementing it with further advice to enable her to make a wise selection of food so that her list of purchases will provide a safe diet.

I am told that the recent rise in the price of milk in some of the large cities has already reduced the consumption of milk by the people. Under the stress of poverty the list of foods purchased becomes restricted and more and more the tendency is to use principally wheat bread, corn bread, oatmeal, rice, peas and beans, or dishes prepared from these, so that the diet becomes derived almost wholly from the seeds of plants. The charts of food values to which I have referred encourage women who are alert and anxious to study the food problems, to buy just such a list of foods as that just enumerated. Milk and green vegetables do not appear to the average

housewife to be economical purchases because they contain much water and do not compare favorably, pound for pound, with the dry cereal grains.

MILK AND GREEN VEGETABLES IMPERATIVE

It is so important that the diet should contain a certain amount of milk and green vegetables because of the special values which these possess from the dietary standpoint, that I want to place special emphasis upon this point and, furthermore, I want to show you why a diet consisting too largely of cereal grains will not induce optimum nutrition.

There has long prevailed in the discussions of matters relating to nutrition, the idea that the essential constituents of the normal diet are protein, carbohydrates and fats, and certain inorganic salts. Since the organic constituents named all furnish energy when they are oxidized, the idea has prevailed that the proportions between the carbohydrates and fats in the food is a matter of little importance. This idea is correct. The eskimo eats little carbohydrate and much fat, while people in the temperate regions eat relatively very much less fat. It is a common misconception, however, that the people in the warmer regions of the world do not eat liberally of fats. They consume much more fats than do the peoples living in the temperate regions. This is purely a matter of convenience and came about through the relative abundance in the tropics of oil-rich fruits and nuts. The temperate regions produce the cereals and other crops which are with few exceptions rich in carbohydrates and poor in fats. Man has adapted himself to the character of the foods which he has found available, and through long usage certain dietary habits have become fixed.

There has been much importance attached to the protein content of the diet, and justly so. I shall not attempt to discuss the merits of the high or low protein diet. Practically all students of nutrition are now agreed that a fairly liberal supply of protein in the diet tends to promote good nutrition better than an amount which closely approximates the physiological minimum. Furthermore, this aspect of nutrition is so well appreciated that it receives the attention of all who concern themselves with the planning of rations.

One of the dietary factors which should be given attention is

the inorganic or mineral content. The research of the last few years has brought to light an importance of this part of the food which was not hitherto suspected.

Another fact of the greatest importance in enabling us to plan adequate dietaries is the knowledge that there exists two substances the natures of which are still unknown which must be present in the diet if an animal is to grow or long maintain a state of health. The existence of one of these has been appreciated only about four years and the other but two. Although we do not know much about the natures of either of these substances we have definite and fairly adequate knowledge regarding where they can be found.

One of those substances is especially abundant in milk and it is fairly abundant in the leaves of plants, but almost without exception is deficient in the seeds of plants. Butter fat is one of the best sources of it. Egg fats are also an excellent source of it. This substance is in these particular kinds of fats and in the leaves of plants, but not in the seeds in adequate amounts.

The second unknown is everywhere abundant except in the following list of foods: polished rice; fats from either animal or vegetable sources; sugars and starches. None of these contain this second food element.

Under ordinary conditions when we take a diet of seeds, or seeds and vegetables, or seeds and milk, or seeds and meat, we get an abundance of the second substance, but we are in more or less serious danger of running a little short on the dietary essential which is not abundant in the seeds but is associated with the leaves and is present in large amount in milk.

There are several cases in the literature of medicine which indicate that serious consequences have actually arisen in Japan and Denmark, due to a specific shortage of that particular unknown thing which is so abundant in butter fats and in milk and in egg fat and in the leaves of plants, but not in the seeds. Up to recent times the practice in Denmark was to feed children on milk containing a moderate amount of fat, but since the introduction of the milk separator, which is very efficient in taking out practically all the fat of milk, a physician named Bloch at Copenhagen has observed about forty-five cases in the last five years of children in the country who were fed on separator milk and vegetable food, who suffered from eye troubles. The eyes become swollen, inflamed and in-

fected, and blindness results unless something is done to correct the faulty diet. The introduction of whole milk causes an immediate response and recovery, providing the eyes are not too badly injured.

During times of famine among the vegetarian people of Japan, hundreds of cases have been recorded of this pathological condition of the eyes in young children; and curiously enough, a certain Japanese physician named Mori has pointed out that the eye trouble in these vegetarian children is cured by giving them chicken livers. As a matter of fact, other livers would cure them just as well. They could be cured just as well with butter fat or eggs.

Another type of malnutrition due to a lack of an unappreciated, unidentified dietary factor is a disease, found in the Orient, that is due to a lack of the second unknown to which I have referred. This is widely distributed in many kinds of food but is nearly absent from polished rice, and this disease which is called beri-beri occurs among those people who eat polished rice as the principal article of diet. The principal feature of this deficiency disease is general paralysis.

One of the most important things to realize is that the chemical analysis of foodstuffs, no matter how completed or by whom made, cannot give the slightest evidence as to the biological values of the foods. Such knowledge can be gained only by properly conducted feeding tests. I have during the last five years perfected a systematic procedure which involves a series of feeding experiments, and which yields results which constitute a *biological analysis* of food-stuffs. Briefly the principle is as follows: a single natural food in a wholesome condition is fed as the sole source of nutriment and then with single or multiple additions of isolated food factors. This will be clear from a simple illustration. If we represent protein by P, inorganic salts by S, the unknown dietary substance associated with certain fats and with the leaves of plants by A, and the remaining unidentified dietary factor by B, the dietary properties of a foodstuff, as the maize kernel, are determined by feeding maize in the following ways:

1. Maize alone
2. Maize + P
3. Maize + S
4. Maize + A
5. Maize + B
6. Maize + P + S
7. Maize + P + A
8. Maize + P + B
9. Maize + S + A
10. Maize + S + B
11. Maize + A + B
12. Maize + P + S + A
13. Maize + P + S + B
14. Maize + P + S + A + B

Only rations 12 and 14 in this series will adequately nourish an animal during growth. This shows that there are three ways in which the maize kernel is deficient, *viz.*, its proteins are not of very satisfactory character; it lacks a sufficient amount of the unknown factor A and it is too poor in certain inorganic salts to support physiological well-being in a growing animal. What I have said about the maize kernel can be said almost without qualification for the other most important cereal grains; wheat and oats, and other common seeds. Since the dietary properties of various seeds are about alike their mixtures are but little better than the single seeds fed as the sole source of nutriment. The seeds are perfectly good foodstuffs so far as they go but we should recognize their deficiencies and see to it that they are combined with such other foods as will make good their shortcomings. Chief among the foods which correct the deficiencies of the seeds are milk and the leaves of plants, such as cabbage, lettuce, spinach, cauliflower and such other leaves as are appetizing as greens. The tubers such as the potato and sweet potato possess a certain amount of corrective character, but are distinctly poorer than the leaf of the plant.

Why do milk and leaf-vegetables make good the dietary deficiencies of the seeds? It is because they are especially rich in those mineral elements, such as calcium, sodium and chlorine, in which the seeds are deficient. They are rich in the unidentified factor A which is abundant in certain fats and in leaves but with few exceptions, not in seeds and their proteins supplement those of the seeds so as to enhance their value.

Whereas an animal can live but a short time when fed oats alone, a mixture of rolled oats, 60 per cent, and a flour made from immature alfalfa leaves, 40 per cent, constitutes a fairly satisfactory monotonous diet from infancy to adult life. Normal development cannot be secured on any mixture of seeds as a restricted diet, but combinations of leaf with seed are in most cases fairly satisfactory.

There are at the present time thousands of people of the working classes in the south who are suffering from a disease known as pellagra. Dr. Goldberger of the Bureau of Public Health in Washington has demonstrated that the disease is the result of a faulty diet.

A year ago, owing to the high cost of foodstuffs, there were several people especially interested in home economics who made inquiry into the question as to what was the least expenditure of

money on which a self-respecting human being might expect to be well nourished. There was such a group of investigators in Chicago about a year ago, and after careful inquiry they decided that in Chicago about forty cents a day was the lowest expenditure on which an adult could be reasonably well nourished.

While that investigation was going on, Mrs. Dewey made an investigation of the insane hospitals and state prisons of New York, and found that they were feeding the prisoners and insane patients in that state on about eleven and six-tenths cents a day.

Dr. Goldberger has produced experimental pellagra in human beings on a diet supplying an abundance of energy and affording considerable variety, but derived too largely from seeds. The governor of one of the southern states agreed to pardon any convict in the state penitentiary who would volunteer to eat such a diet as Dr. Goldberger might prescribe until he chose to discontinue the experiment. There were eleven of them who took the chance.

He kept these men in the country on a sunny slope under ideal hygienic conditions. They were given dishes prepared from the following list of foodstuffs: bolted wheat flour, corn meal, oatmeal, corn starch, sugar, syrup, bacon fat, cabbage, collards, turnip greens and sweet potatoes.

After five and a half months five of the eleven men in this experimental group showed distinct signs of pellagra. In some of the insane hospitals and orphanages of the south where formerly there was a high incidence of pellagra, Dr. Goldberger found the disease to disappear when an adequate diet was supplied. I venture to say that the trouble with the diets of the people in these regions is the very high percentage derived from the seeds of plants or products made by milling or polishing the seeds. There is an element of danger in restricting the diet of either man or animal too largely to products of this class.

Dr. Goldberger has pointed out that the diet of many of the poor people of the south consists in winter of corn bread, salt pork and molasses. This they eat with little variety in the way of other additions, and by the end of winter come down with the disease. From what I have said of the nature of the dietary deficiencies of the seeds the nature of the deficiencies of the pellagra-producing diets is fairly clear. The fault does not lie in any one dietary deficiency but in poor quality with respect to several factors.

The greatest nutritional problems before us now are two in number. First we must find a way to provide the leafy vegetables at moderate prices to the people of our cities. These foods should be the least expensive of all. They are great producers and are easily handled, but because of their tendency to spoilage the present system of marketing renders them a hazardous class of foods for the retail dealer to handle and the prices are accordingly exhorbitant. One of the greatest boons which could possibly come to the poor people throughout the world would be the discovery of a plant which is a good agricultural crop, whose leaves are not fleshy, but of a character which permits their being promptly dried in the sun as are our hay crops, and the immature leaves of which could be converted into a flour with good keeping qualities. Such a leaf must be free from tannins and other bitter principles and so nearly tasteless that it could be incorporated with wheat flour to the extent of 20–25 per cent without destroying the pleasant flavor of the wheat loaf. Such a bread would have dietary properties vastly superior to any variety of dishes derived from wheat, corn, oats and rice when prepared without the use of milk and taken without sufficient vegetables to correct their deficiencies.

If such a plant can be found and the public educated to the regular use of such a mixed flour the health of all peoples who live on a restricted diet would be greatly improved. Since high ideals, ambition and agressiveness are promoted by physiological well being, the gain to society would be very great indeed. I have the hearty coöperation of Mr. Fairchild of the Bureau of Plant Industry in securing plants which may meet these requirements.

The second fundamentally important dietary problem with which we have to deal is the preservation of the dairy industry. The prices of feeding stuffs have gone up 100 to 200 per cent while the price of milk has advanced only about 20 per cent. Such a condition makes milk production unprofitable and will lead, if not remedied, to an abandonment of the dairy industry. Such an event would be a misfortune of the gravest consequences to the public health. We have long been accustomed to the use of milk in liberal amounts in cookery, and of cream, butter and cheese. It is not generally appreciated that these articles have a dietary value far greater than can be expressed by their protein and energy content. They act as correctives for the deficiencies of the cereal

grains and without them the nutrition of our people will suffer serious impairment.

The nation-wide cry against further advance on the cost of milk is unjust and dangerous. The cost of milk must go up and up so far as is necessary to insure that the dairy industry shall remain a paying one.

The only alternative in dietary practice which can maintain the health and efficiency of our population is the adoption of a new type of diet derived in suitable amount from leaf flour. This, however, involves still unsolved problems and cannot at once be put into effect. The only product which can in some measure meet the requirements is the flour prepared from the alfalfa leaf. It is not entirely satisfactory as a human food but baking tests made in the departments of Home Economics at several universities have shown that 10–12 per cent of alfalfa leaf flour can be used with wheat flour without affecting perceptably the physical properties of the wheat loaf. Bread prepared from mixed flour of this character is slightly green but does not differ greatly from whole wheat bread in taste. More than 12–14 per cent of the leaf produces a slightly stringent taste which renders the product less acceptable to the human palate. A better leaf flour should be found for this purpose and I believe this will be accomplished before long. Such a leaf would not, however, do away with the need of milk and its products. The appetizing nature of these and their capacity in culinary practices of conferring palatability upon other foods make them foods for which there can be found no substitutes.

The mixed seed and leaf flour which I have described will serve only as a cheap and safe food for those whose earnings do not permit the use of foods other than the cheapest, *viz.*, the seed products, molasses, etc. For these meats do not form efficient dietary supplements and their purchase is not logical. We could entirely dispense with meats without suffering any ill effects whatever, but if we permit the use of milk, even in the diet of adults, to fall much below the present consumption, its effects will soon become apparent in our national efficiency.